CLAIMS

1. An electron beam substrate processing apparatus, comprising:

a substrate processing chamber defined by sidewalls, a bottom, and a top;

a spindle motor assembly moveably disposed within the substrate processing chamber;

a spindle shaft extending from the spindle motor assembly toward the top;

a substrate support member mounted to an end of the spindle shaft distal the spindle motor assembly;

an encoder wheel coupled to the spindle shaft and positioned adjacent the substrate support member;

an optical detector positioned in optical communication with the encoder wheel, the optical detector being configured to output rotation data signals in response to detected rotation of the encoder wheel;

a controller configured to output corrected pattern clock signals in response to the rotation data signals; and

an electron beam assembly attached to the substrate processing chamber and configured to direct an electron beam onto a surface of the substrate for processing.

2. The apparatus of claim 1, further comprising an actuator coupled to the spindle motor assembly and configured to move the spindle motor assembly in a horizontal motion relative a longitudinal axis of the spindle shaft.

3. The apparatus of claim 1, further comprising a vacuum pump coupled to the substrate processing chamber to provide a vacuum therein.

4. The apparatus of claim 1, wherein the controller comprises a motor speed control circuit configured to process at least some of the rotation data signals to control the rotational motion of the spindle shaft.

5. The apparatus of claim 1, wherein the controller comprises a data signal processing circuit configured to process at least some of the rotation data signals and output the corrected pattern data signals in response thereto to the electron beam assembly for control thereof.

6. A method of processing substrates with an electron beam processing system, comprising:

rotating a substrate support member configured to hold the substrate thereon for processing;

generating rotation data signals from an encoder assembly associated with a rotational movement of the substrate support member;

generating corrected pattern clock signals from the rotation data signals associated with the rotational movement of the substrate support member; and

processing at least some of the corrected pattern clock signals to generate a corrected electron beam processing pattern for writing a pattern on a surface of the substrate.

7. The method of claim 6, wherein the generating rotation data signals comprises optically detecting the rotational movements of an encoder wheel in axial alignment with and adjacent the rotating substrate support member.

8. The method of claim 6, further comprises processing at least some of the rotation data signals with a motor control circuit configured to maintain one or more desired rotational speeds of the substrate support member.

9. The method of claim 6, wherein a frequency of the pattern clock signals is greater than a frequency of the rotation data signals.

10. The method of claim 6, wherein the generating corrected pattern clock signals comprises determining one or more shaft rotation deviations associated with the rotation data signals.

11. The method of claim 10, wherein the determining one or more shaft rotation deviations comprises detecting the deviations from the rotation data signals.

12. The method of claim 11, wherein the processing at least some of the corrected pattern clock signals to generate the corrected pattern data signal comprises processing at least some of the deviations detected to generate the corrected pattern clock signals.

13. An apparatus for processing a substrate with electron beams, comprising:

rotation means for rotating a substrate support member for processing the substrate thereon;

signal generator means for generating a rotation clock signal from the axial rotation of the substrate;

means for generating a corrected pattern clock signal from the axial rotation of the substrate; and

an electron beam generation means for processing the substrate with electron beams associated with the corrected pattern clock signal.

14. The apparatus of claim 13, further comprising processor means for processing the corrected pattern clock signal to generate a corrected substrate process pattern therefrom.

15. The apparatus of claim 13, wherein the rotation means comprises a movable spindle motor assembly having a spindle shaft extending therefrom coupled on one end to the substrate support member.

16. The apparatus of claim 15, wherein the signal generator means comprises at least one encoder wheel positioned on the spindle shaft parallel to and adjacent a substrate support member configured to support the substrate thereon for processing.

17. The apparatus of claim 15, wherein the signal generator means comprises a means for detecting timing marks on the at least one encoder wheel to generate the rotation clock signal.

18. The apparatus of claim 15, wherein the means for generating a corrected pattern clock signal comprises a deviation detector means for detecting at least one aberration associated with the axial rotational velocity of the substrate.

19. The apparatus of claim 18, wherein the deviation detector means comprises a phase locked loop configured to output the corrected pattern clock signal.

20. The apparatus of claim 19, wherein the phase locked loop comprises an oscillator circuit configured to maintain lock with the rotation clock signal and another oscillator circuit configured to receive a corrected version of the rotation clock signal and generate the corrected pattern clock signal therefrom.